IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Appellant:	Confirmation No.: 9152
Kazunari HONMA et al.	Group Art Unit: 2814
Application No.: 10/631,858	Examiner: Howard WEISS
Filed: August 1, 2003	Attorney Dkt. No.: 024808-00014

For: DIELECTRIC DEVICE HAVING DIELECTRIC FILM TERMINATED BY HALOGEN ATOMS

SUBSTITUTE BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

Date: August 10, 2006

I. INTRODUCTION

This is an appeal from the action of the Examiner dated June 13, 2005, finally rejecting pending Claims 1 and 4-10 of this application, as being unpatentable over certain prior art under 35 U.S.C. § 103. A Notice of Appeal was timely filed on October 13, 2005 with a Petition for Extension of Time. This Substitute Brief is being timely filed in reply to an Order Returning Undocketed Appeal to Examiner, which indicated that the Appeal Brief filed on February 8, 2006 was not ready for docketing for containing a deficient "Summary of claim subject matter" section. Appellants respectfully submit that the instant Substitute Brief is believed to address and correct the noted deficiency therein.

II. REAL PARTY IN INTEREST

The real party in interest in the present application on appeal is Sanyo Electric Company, Ltd. Of Osaka, Japan (Sanyo).

III. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to the Appellant, Appellant's representative or Assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

IV. STATUS OF CLAIMS

Claims 1 and 4-21 are pending. Claims 1 and 4-10 are rejected while the Examiner has withdrawn Claims 11-21 from consideration for being directed to non-elected subject matter. Claims 1 and 4-10 are being appealed.

V. STATUS OF AMENDMENTS

All amendments have been entered and/or will be entered upon filing of the instant Appeal Brief as indicated in the Advisory Action dated September 22, 2005.

VI. SUMMARY OF THE CLAIMED SUBJECT MATTER

The sole independent claim on appeal, that is, Claim 1, recites "A dielectric device comprising:

such a first electrode layer that constituent elements located on its surface are terminated by halogen atoms; and

a dielectric film formed on the surface of said first electrode layer terminated by said halogen atoms,

wherein said first electrode layer contains at least one element selected from a group consisting of Pt, Ir, Pd and Ru and said halogen atoms are fluorine atoms."

An example of the "first electrode" is identified by reference number 4 in Figures 1-2, for example, as discussed on page 16, lines 5-6. Flourine atoms F terminate

platinum atoms Pt located on the surface 4a of the lower electrode (see Figure 2). The platinum atoms Pt are examples of the "constituent elements of the first electrode" recited in Claim 1 and the fluorine atoms F are examples of the "halogen atoms" recited in Claim 1 as well. See page 16, lines 7-13 and Figure 2 of the application. A ferroelectric film 5 includes an SBT having a bismuth layer structure formed on the surface 4a of the lower (first) electrode 4 terminated by the flourine atoms F. The ferroelectric film 5 is an example of the "dielectric film" (see page 17, lines 2-3) and as noted above, the fluorine atoms F are examples of the "halogen atoms". As shown in Figure 2, the first electrode 4 clearly contains at least one element selected from a group consisting Pt, Ir, Pd and Ru, since platinum atoms Pt are clearly illustrated as being included in the first electrode 4 and Figure 2 further clearly illustrates the "halogen atoms" are the fluorine atoms F.

In essence, the claimed subject matter relates to a dielectric device having a dielectric film formed on an electrode layer. As is clear from the above mapping of Claim 1, one example of this dielectric device is illustrated in Figures. 1-2.

This dielectric device includes an SiO_2 film (2) formed on an Si substrate (1) with an IrSiN adherent layer (3) formed on the SiO_2 film (2). A lower electrode or first electrode layer (4) includes constituent elements selected from at least one of platinum atoms Pt, Iridium atoms Ir, palladium atoms Pd, and/or ruthenium atoms Ru that are formed on the IrSiN adherent layer (3).

As shown in Figure 2, halogen atoms, e.g., fluorine atoms F, terminate the constituent elements, e.g., platinum atoms Pt, Iridium atoms Ir, palladium atoms Pd and/or ruthenium atoms Ru, disposed on the surface (4a) of the lower electrode or first

electrode layer (4). An SBT ferroelectric film (5) having a bismuth layer structure is formed on the surface (4a) of the lower electrode or first electrode layer (4) and is terminated by the halogen atoms, e.g., fluorine atoms F. The SBT ferroelectric film (5) includes a pseudo-perovskite layer (5a) held between a pair of bismuth oxide layers (5b), wherein the a-axis and b-axis of the SBT ferroelectric film (5) are perpendicular, i.e., orthogonal, to the surface (4a) of the lower electrode or first electrode layer (4). In other words, the bismuth oxide layers (5b) are perpendicular to the surface (4a) of the lower electrode (4). Because oxygen atoms O of the pseudo-perovskite layer (5a) bond to one of the halogen atoms, e.g., flourine atoms F, the constituent elements, such as the platinum atoms Pt, are terminated. It should be noted that in an embodiment of this dielectric film, the bismuth layer structure is an $SrBi_2Ta_2O_9$ film.

Accordingly, the halogen atoms, e.g., fluorine atoms F, terminate the constituent elements, e.g., platinum atoms Pt, located on the surface (4a) of the lower electrode (4), whereby the bismuth Bi of the ferroelectric film (5) is prevented or inhibited from bonding to the constituent elements, e.g., platinum atoms Pt, located on the surface (4a) of the lower electrode (4). As such, the ferroelectric film (5) is successfully formed on the surface (4a) of the lower electrode (4) whereby the bismuth oxide layers (5b) of the ferroelectric film (5) are perpendicular or orthogonal to the surface (4a) of the lower electrode (4). Because the a-axis and b-axis of the ferroelectric film (5) is perpendicular to the surface (4a) of the lower electrode (4), the ferroelectric film obtains or exhibits a large polarization capacity. Specification, page 15, line 13 to page 17, line 23 and Figures 1-2.

As noted in the *Field of the Invention* section of the instant application, the related art suffers from the drawback of bismuth oxide layers (105b) easily bonding to the lower electrode (104), which includes platinum atoms Pt. Because the bismuth Bi bonds so easily to the platinum atoms Pt forming the lower electrode (104), the bismuth oxide layers (105b) readily extend in parallel to the surface of the lower electrode (104) having the platinum atoms Pt. In such a case, the a-axis and b-axis of the ferroelectric film (105) having the bismuth oxide layers (105b) are parallel to the surface of the lower electrode (104). The parallel arrangement of the a-axis and b-axis of the ferroelectric film (105) significantly decreases the ferroelectricity of conventional dielectric films. Specification, page 1, line 6 to page 6, line 6 and Figure 10.

Accordingly, the dielectric film of the instant application overcomes the drawbacks of the conventional dielectric film by successfully rearranging the direction of the a-axis and b-axis of the ferroelectric film (5) so as to be perpendicular to the surface (4a) of the lower electrode (4), wherein the ferroelectricity of the dielectric film is significantly increased, and hence improved.

VII. GROUNDS OF REJECTION

Claims 1-6 and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,783,998 to Nakamura (hereinafter "Nakamura") in view of U.S. patent No. 4,581,099 to Fukaya et al. (hereinafter "Fukuya"). Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura and Fukaya, as applied to Claim 1 above, and further in view of JP 11-068057 to Furukawa (hereinafter "Furukawa"). Claim 9 is rejected under 35 U.S.C. §103(a) as being unpatentable over

Nakamura and Fukaya, as applied to Claim 1 above, and further in view of U.S. Patent No. 6,046,469 to Yamazaki et al. (hereinafter "Yamazaki"). Claim 10 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura, Fukaya, and Yamazaki, as applied to Claim 1 above, and further in view of U.S. Patent No. 6,320,213 to Kirlin et al. (hereinafter "Kirlin").

VIII. APPELLANT'S ARGUMENTS

Legal Overview

Several basic factual inquiries must be made to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103. These factual inquiries are set forth in Graham v. John Deere Co., 383 U.S. 1, 17, (1966):

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; the level of ordinary skill in the pertinent art resolved. Against this backdrop, the obviousness or non-obviousness of the subject matter is determined.

The specific factual inquiries set forth in *Graham* have not been considered or properly applied by the Examiner formulating the rejections of the claims. Particularly the differences between the prior art and the claims were not properly determined. As stated by the Federal Circuit in In re Ochiai, 37 U.S.P.Q. 2d 1127, 1131 (Fed. Cir. 1995):

> [t]he test of obviousness *vel non* is statutory. It requires that one compare the claim's subject matter as a whole with a prior art to which the subject matter pertains. 35 U.S.C. § 103.

> The inquiry is highly fact-specific by design.... When the references cited by the Examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. In re Fine, 837 F.2d 1071, 1074, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). (Emphasis added.)

When rejecting claims under 35 U.S.C. §103, an Examiner bears an initial burden of presenting a prima facie case of obviousness. A prima facie case of obviousness is established only if the teachings of the prior art would have suggested the claimed subject matter to a person of ordinary skill in the art. If an Examiner fails to establish a prima facie case, the rejection is improper and will be overturned. See: In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q. 2d. 1955 (Fed. Cir. 1993). "If examination.... does not produce a prima facie case of unpatentability, then without more the applicant is entitled to the grant of the patent." In re Oetiker, 977 F.2d 1443, 1445 – 1446, 24 U.S.P.Q. 2d. 1443, 1444 (Fed. Cir. 1992).

Moreover, it is well established that "[i]f an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." In re Fine, 837 F.2d 1071, 1076, 5 USPQ2d 1596 (Fed. Cir. 1988).

Appellants respectfully submit that the Examiner has not made a proper *prima facie* rejection under 35 U.S.C. §103(a), because the combination of prior art references cited fails to teach or suggest the present invention as claimed and because it would not be obvious to combine the cited references.

Claims 1, 4-6 and 8 were improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura (U.S. Patent No. 6,783,998 B2) in view of Fukaya et al. (U.S. Patent No. 4,581,099)

In the Office Action dated June 13, 2005, Claims 1-6 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Fukaya. In making this rejection, the Office Action asserts that Nakamura shows most, i.e., not all, aspects of the claimed invention, for example, Figure 1(a) and column 4, lines 36-67, including a first or lower electrode (1) containing platinum Pt that is formed by etching using fluoride gas to form a platinum fluoride on its surface (column 7, line 58 to column 8, line 35); a ferroelectric film (2) of $SrBi_2TaO_9$; and a second electrode (3). The Office Action then admits that Nakamura does not explicitly show the surface of the first or lower electrode (1) being terminated by the fluorine atoms. Fukaya is cited for teaching that it is well known in the industry that etching with halogen atoms, such as fluorine, terminates the material being etched. The Office Action further asserts it would have been obvious to one of ordinary skill in the art at the time of invention to terminate the surface of the first or lower electrode (1) of Nakamura since Fukaya teaches that etching with halogen atoms, such as fluorine, terminates the material being etched.

Appellants submit Nakamura teaches the patterning of a first or lower electrode (1) containing Pt is carried out together with the dielectric layer (2) and the upper electrode (3), simultaneously, or is carried out independently relative to the other layers, i.e., the dielectric layer (2) and the upper electrode (3). Figure 1 and column 4, lines 36-67 of Nakamura.

In the first situation where the patterning of a first or lower electrode (1) is carried out together with the dielectric layer (2) and the upper electrode (3) simultaneously, the Appellants note that because the dielectric layer (2) is formed on the upper surface of the first electrode (1) during the etching process, the upper surface of the first or lower

electrode (1) is not exposed during the etching process. Therefore, Appellants submit that when the etching process is carried out simultaneously with the upper electrode (3) on the dielectric layer (2), which is on the first or lower electrode (1), it is not possible for platinum fluoride to be formed on the upper surface of the first or lower electrode (1) due to the presence of the dielectric layer (2) and upper electrode (3) on the surface of the first or lower electrode (1).

In the second situation where the patterning of the first or lower electrode (1) is carried out independently, that is, only to the first or lower electrode (1), Appellants note an etching mask, such as a resist, is formed on the upper surface of the first or lower electrode (1) during such an etching process (e.g., see Figure 2(a) of Nakamura). As such, Appellants submit the upper surface of the first or lower electrode (1) is not exposed during such an etching process because that is exactly where the dielectric layer is formed. Therefore, Appellants submit that even when the etching process is carried out only to the first or lower electrode (1), platinum flouride is not formed on the upper surface of the first or lower electrode (1) on which the dielectric layer (2) is placed.

Appellants note that Fukaya teaches etching with halogen atoms, such as fluorine, terminates a surface of the material being etched. However, Appellants point out that Fukaya teaches a situation wherein only the portion of the surface exposed during the etching process is terminated by fluorine and that the portion of the surface that is not exposed during the etching process is not terminated by fluorine. Further, Appellants submit Fukaya fails to teach or suggest the electrode contains at least one

element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine.

The outstanding Office Action dated June 13, 2005 asserts that there are many etching processes available to one of ordinary skill in the art in which the surface of the electrode material is exposed. Presumably as examples of such a proposition, the Office Action cites U.S. Patent Number 6,323,132 to Hwang et al. (hereinafter "Hwang et al.") for teaching the removal of a mask during etching a platinum electrode layer (column 6, lines 26-32); and Fukaya for teaching removal of a photoresist layer (i.e., mask) before subsequent etching. The Office Action also asserts, without providing or citing any supporting facts and/or arguments, that Nakamura leaves the method of etching up to one of ordinary skill in the art.

Appellants maintain that while Fukaya discloses an electrode exposed to flourine, Fukaya fails to teach or suggest the electrode contains at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine.

As noted above, the Office Action admits Nakamura fails to explicitly show, i.e., disclose or teach, the surface of the first or lower electrode (1) being terminated by fluorine atoms.

Furthermore, regarding Hwang et al., Appellants note that while Hwang et al. disclose a mask (18) formed on a Pt (16) that is etched using Ar, Cl_2, and BCl_3 gases, during such a process, the surface of Pt (16) is not terminated by fluorine when the mask (18) is removed by etching because Ar, Cl_2 and BCl_3 gases, not fluorine, are used in the etching process.

Appellants respectfully note that Nakamura, Fukaya and Hwang et al. all fail to teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine.

The Office Action states that there are many etching processes available to one of ordinary skill in the art in which the surface of the electrode is exposed. Yet, the Office Action fails to apply or cite a single reference in which the surface of a first electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru is terminated by fluorine during an etching process.

Further, the Office Action asserts, without citing any supporting facts and/or arguments, that Nakamura leaves the method of etching up to one of ordinary skill in the art. Appellants respectfully submit the assertion is, at best, partially correct. To the extent Nakamura leaves selection of the etching process up to one of ordinary skill in the art, Appellants note Nakamura clearly and unambiguously states the process of etching is to be dry-etching. See column 3, line 20, line 46, and line 55 of Nakamura. To the extent one of ordinary skill in the art is given a choice, Nakamura states the dry-etching should be performed using either fluorine gas or chlorine gas. See column 3, line 21, lines 22-25, line 47, and line 56 of Nakamura. As noted above, Nakamura clearly states the patterning of the first electrode (1) via etching is performed either simultaneously with the lower electrode (1), dielectric layer (2), and the upper electrode (3) stacked on top of each other, or independently on the lower electrode (1) alone. See column 4, lines 36-60 of Nakamura. Then, from column 6, line 27 to column 11, line 30, Nakamura explains in detail as to why Rhenium (Re) should be used during the dry-etching process. As such, Appellants submit Nakamura does not leave the manner

in which the electrode is etched up to one of ordinary skill in the art as asserted by the Office Action. To the contrary, Nakamura is rather specific as to the conditions under which the electrode is to be etched, but does give the choice as to whether the dry-etching should be performed using either fluorine or chlorine gas.

Claim 1 recites a dielectric device comprising a first electrode layer having constituent elements located on its surface and terminated by halogen atoms, and a dielectric film formed on the surface of the first electrode layer that is terminated by said halogen atoms, wherein the first electrode layer contains at least one element selected from a group consisting of Pt, Ir, Pd and Ru and the halogen atoms are fluorine atoms. Appendix I.

Moreover, as noted above, the Office Action admits Nakamura fails to teach or suggest a first or lower electrode that is terminated by fluorine atoms. Further, even though the first or lower electrode of Nakamura contains platinum Pt, for the reasons provided above, Appellants respectfully submit that regardless of whether the first electrode is patterned simultaneously with other structural layers or by itself, platinum fluoride is not formed on the upper surface of the first electrode on which a dielectric layer is formed. Of the remaining references cited by the Office Action in maintaining the rejection, Appellants respectfully submit that Fukaya and Hwang et al. fail to teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine.

Accordingly, Appellants respectfully submit that the art of record, i.e., Nakamura, Fukaya, and Hwang et al., alone or in any combination, fails to suggest the features recited by Claim 1 because Nakamura, Fukaya, and Hwang et al. each fail to

teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine. Therefore, Appellants respectfully submit that the Office Action has failed to establish a prima facie case of obviousness and the rejection of Claim 1 is improper. Moreover, Appellants respectfully submit that one of ordinary skill in the art would not deem it obvious to modify Nakamura according to the teachings of Fukaya and/or Hwang et al. because to do so would not arrive at the invention recited by Claim 1.

Consequently, the combination of Nakamura, Fukaya, and Hwang et al. fails to teach and/or suggest the claimed invention recited in Claim 1. Claims 4-6 and 8 depend from Claim 1. Therefore, Appellants respectfully submit that Claims 1, 4-6 and 8 were improperly rejected under 35 U.S.C. §103(a) and are patentable over the combination of Nakamura and Fukaya, as well as Hwang et al.

Claim 7 was improperly rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Fukaya as applied to Claim 1 above, and further in view of JP 11-068057 to Furukawa

In the Office Action dated June 13, 2005, Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Fukaya, as applied to Claim 1 above, and further in view of Furukawa. In making this rejection, the Office Action asserts that although Nakamura and Fukaya fail to show a bismuth layer being substantially perpendicular to the first electrode layer, Furukawa teaches, e.g., Figures 2-3, a bismuth layer being substantially perpendicular to the first electrode layer to provide a dielectric device with superior polarization characteristics. The Office Action then asserts that it would have been obvious to one of ordinary skill in the art at the time of invention to have the bismuth layer being substantially perpendicular to the first electrode layer as taught by

Furukawa in the device of Nakamura and Fukaya to provide a dielectric device having superior polarization characteristics.

Appellants respectfully submit that the Office Action mischaracterizes that which is taught by Furukawa, especially in Figures 2-3, and reaches an erroneous conclusion regarding the obviousness of the cited combination. Rather, Appellants respectfully note that in Figure 2 of Furukawa, a crystal structure $Bi_2Sr_2CuO_6$ constituting the lower and upper electrodes is disclosed. In Figure 3 of Furukawa, a crystal structure of $SrBi_2Ta_2O_9$ constituting a ferroelectric film is disclosed. However, Appellants respectfully point out that neither one of Figure 2 or Figure 3 of Furukawa discloses a structure wherein a bismuth layer is formed to be substantially perpendicular to the first electrode layer in the ferroelectric film having a bismuth layer structure as asserted by the Office Action. Rather, the bismuth layer taught in Figures 2-3 of Furukawa, when translated onto figure would appear to suggest the prior art shown in Figure 10 of the present application. Further, Appellants note Claim 7 recites a bismuth layer is formed to be substantially perpendicular to the first electrode layer in the ferroelectric film having the bismuth layer structure.

Claim 7 depends indirectly from Claim 1 and incorporates all the features recited therein. Appellants further note that since Furukawa fails to teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine, Appellants respectfully submit that Furukawa does not overcome the deficiencies of Nakamura and Fukaya discussed above in addition to failure to teach or suggest that which is recited in Claim 7.

Because Fukaya and Nakamura, alone or in combination, fail to teach or suggest each and every feature of Claim 1, from which Claim 7 depends and includes all of the features thereof, because Furukawa does not overcome the deficiencies of Fukaya and Nakamura, and because Furukawa does not even teach or suggest that which is recited in Claim 7, Appellants respectfully submit that one of ordinary skill in the art would not deem it obvious to combine the teachings of the cited references because to do so would not arrive at the invention recited by Claim 7. Therefore, Appellants respectfully submit that Claim 7 was improperly rejected under 35 U.S.C. §103(a) and is patentable over the combination of Nakamura, Fukaya, and Furukawa.

Claim 9 was improperly rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Fukaya as applied to Claim 1 above, and further in view of Yamazaki et al. (U.S. Patent No. 6,046,469)

In the Office Action dated June 13, 2005, Claim 9 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Fukaya, as applied to Claim 1 above, and further in view of Yamazaki. In making this rejection, the Office Action asserts that Nakamura and Fukuya show most aspects of the instant invention except for an adherent layer being formed under the first electrode layer. The Office Action then asserts that Yamazaki teaches the formation of an adherent layer (12, 13) under a first electrode (14) to provide a semiconductor device with good ohmic characteristic (column 2, lines 40-44). The Office Action further asserts it would have been obvious to a person of ordinary skill in the art at the time of invention to form an adherent layer under a first electrode as taught by Yamazaki in the Nakamura and Fukaya semiconductor device to provide the device with good ohmic characteristic.

Appellants note Yamazaki teaches a lower electrode consisting of a first platinum-rhodium alloy (PtRh) film (14) and a first platinum-rhodium alloy oxide (PtRhOx) film (15) wherein a titanium nitride (TiN) film (13) as a barrier metal and an adhesion film (12) made of titanium (Ti) are provided between a polysilicon plug (5) and the first platinum-rhodium alloy (PtRh) film (14) such that the barrier metal or titanium nitride (TiN) film (13) is under the film (14) while the adhesion film (12) is under titanium nitride (TiN) film (13). Figure 1 of Yamazaki. However, Yamazaki fails to teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine.

Claim 9 depends directly from Claim 1 and incorporates all the features recited therein. Appellants further note that since Yamazaki fails to teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine, Appellants respectfully submit that Yamazaki does not overcome the deficiencies of Nakamura and Fukaya discussed above in addition to failure to teach or suggest that which is recited in Claim 9.

Because Fukaya and Nakamura, alone or in combination, fail to teach or suggest each and every feature of Claim 1, from which Claim 9 depends and includes all of the features thereof, and because Yamazaki does not overcome the deficiencies of Fukaya and Nakamura, Appellants respectfully submit that one of ordinary skill in the art would not deem it obvious to combine the teachings of the cited references because to do so would not arrive at the invention recited by Claim 9. Therefore, Appellants respectfully submit that Claim 9 was improperly rejected under 35 U.S.C. §103(a) and is patentable over the combination of Nakamura, Fukaya, and Yamazaki.

Claim 10 was improperly rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Fukaya and Yamazaki as applied to Claim 9 above, and further in view of Kirlin et al. (U.S. Patent No. 6,320,213)

In the Office Action dated June 13, 2005, Claim 10 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura, Fukaya, and Yamazaki as applied to Claim 9 above, and further in view of Kirlin. Note: The Office Action actually states Claim 10 is rejected as being unpatentable over Nakamura, Fukaya and Yamazaki as applied to Claim 1 above, but Appellants respectfully submit the reference to Claim 1 is a typographical error and should have indicated Claim 9 instead of Claim 1. In making this rejection, the Office Action asserts that Nakamura and Fukuya show most aspects of the instant invention except for an adherent layer including IrSiN. The Office Action then asserts that Kirlin teaches the use of IrSiN to reduce diffusion of aluminum and platinum (column 4, lines 57-67). The Office Action further asserts it would have been obvious to a person of ordinary skill in the art at the time of invention to use IrSiN in the Nakamura, Fukaya, and Yamazaki semiconductor device to reduce the diffusion of aluminum and platinum.

Appellants note Kirlin fails to teach or suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine. Further, Kirlin fails to teach the diffusion barrier layer (108) as an "adherent layer." Rather, Kirlin teaches the layer (107) performs the function of the adherent layer. Put simply, it appears as if Kirlin teaches the IrSiN in the barrier layer (108) is actually on the adherent layer (107) and not in the adherent layer (107).

Claim 10 depends from Claim 9, which depends from Claim 1, and incorporates all the features recited therein. Appellants further note that since Kirlin fails to teach or

suggest an electrode containing at least one element selected from a group consisting of Pt, Ir, Pd and Ru that is terminated by fluorine, Appellants respectfully submit that Kirlin does not overcome the deficiencies of Nakamura, Fukaya, and Yamazaki discussed above in addition to failure to teach or suggest that which is recited in Claim 10.

Because Fukaya, Nakamura, and Yamazaki, alone or in combination, fail to teach or suggest each and every feature of Claim 1, from which Claim 10 depends and includes all of the features thereof, and because Kirlin does not overcome the deficiencies of Fukaya, Nakamura, and Yamazaki, Appellants respectfully submit that one of ordinary skill in the art would not deem it obvious to combine the teachings of the cited references because to do so would not arrive at the invention recited by Claim 10. Therefore, Appellants respectfully submit that Claim 10 was improperly rejected under 35 U.S.C. §103(a) and is patentable over the combination of Nakamura, Fukaya, Yamazaki, and Kirlin.

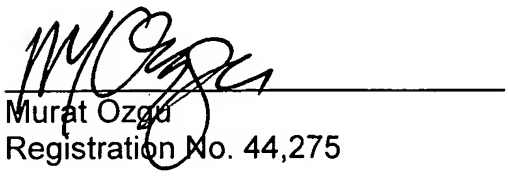
Conclusion

For all of the above-noted reasons, it is strongly contended that clear differences exist between the present invention recited in claims 1 and 4-10 and the prior art asserted by the Office Action. It is further contended that these differences are such that the present invention would not have been obvious to a person having ordinary skill in the art at the time the invention was made.

This final rejection being in error, therefore, it is respectfully requested that this Honorable Board of Patent Appeals and Interferences reverse the Examiner's decision in this case and indicate the allowability of claims 1 and 4-10.

In the event that this paper is not considered timely filed, applicants respectfully petition for an appropriate extension of time. Any fees for such extension, together with any additional fees which may be due with respect to this paper, may be charged to our Deposit Account No. 01-2300, making reference to attorney docket number 024808-00014.

Respectfully submitted,



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Enclosure: Appendix 1 - Claims on Appeal; Appendix 2; Appendix 3

APPENDIX 1

CLAIMS ON APPEAL

1. (**Previously Presented**) A dielectric device comprising:

such a first electrode layer that constituent elements located on its surface are terminated by halogen atoms; and

a dielectric film formed on the surface of said first electrode layer terminated by said halogen atoms,

wherein said first electrode layer contains at least one element selected from a group consisting of Pt, Ir, Pd and Ru and said halogen atoms are fluorine atoms.

Claims 2-3. (**Cancelled**)

4. (**Previously Presented**) The dielectric device according to claim 1, wherein said first electrode layer contains Pt, and platinum fluoride is formed on the surface of said first electrode layer.

5. (**Original**) The dielectric device according to claim 1, wherein said dielectric film includes a ferroelectric film having a bismuth layer structure.

6. (**Original**) The dielectric device according to claim 5, wherein said ferroelectric film having a bismuth layer structure is an $SrBi_2Ta_2O_9$ (SBT) film.

7. (**Original**) The dielectric device according to claim 5, wherein a bismuth layer is formed to be substantially perpendicular to said first electrode layer in said ferroelectric film having a bismuth layer structure.

8. (**Original**) The dielectric device according to claim 1, further comprising a second electrode layer formed on said dielectric film.

9. (**Original**) The dielectric device according to claim 1, further comprising an adherent layer formed under said first electrode layer.

10. (**Original**) The dielectric device according to claim 9, wherein said adherent layer includes an IrSiN film.

11. (**Withdrawn**) A method of manufacturing a dielectric device comprising steps of:

terminating constituent elements located on the surface of a first electrode layer by halogen atoms; and

forming a dielectric film on the surface of said first electrode layer terminated by said halogen atoms.

12. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 11, wherein said step of terminating said constituent elements by said halogen atoms includes a step of exposing the surface of said first electrode layer into either a plasma or a solution containing halogen ions thereby terminating said constituent elements located on the surface of said first electrode layer by said halogen atoms.

13. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 11, further comprising a step of performing heat treatment after formation of said dielectric film thereby crystallizing said dielectric film.

14. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 11, wherein said halogen atoms are fluorine atoms.

15. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 14, wherein said first electrode layer contains Pt, and platinum fluoride is formed on the surface of said first electrode layer.

16. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 11, wherein said step of forming said dielectric film includes a step of forming a ferroelectric film having a bismuth layer structure.

17. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 16, wherein said ferroelectric film having a bismuth layer structure is an $SrBi_2Ta_2O_9$ (SBT) film.

18. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 16, wherein said step of forming said ferroelectric film having a bismuth layer structure includes a step of forming said ferroelectric film having a bismuth layer structure so that a bismuth layer is substantially perpendicular to said first electrode layer.

19. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 11, further comprising a step of forming a second electrode layer on said dielectric film.

20. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 11, further comprising a step of forming an adherent layer under said first electrode layer.

21. (**Withdrawn**) The method of manufacturing a dielectric device according to claim 20, wherein

said adherent layer includes an IrSiN film.

APPENDIX 2

EVIDENCE

None submitted

APPENDIX 3

RELATED PROCEEDINGS

None submitted